International Journal of Teaching & Education
ISSN: 2653-6579, Volume 2, Issue 2, page 53 - 63
ISSN 2653-6579
Zambrut

International Journal of Research & Review
Proceeding & Conference
Thesis & Antithesis
Novelty & Findings
Sciences; Economics & Business; Social, Politics & Humanities; Law; Engineering & Industry; Biology, Physics & Matematics; Agriculture & Agribusiness; Health, Nursing, & Medicine; Informatics, Technology & Computers; Food & Nutrition
Zambrut

Students' Involvement in Physics Club Activities and Science and Engineering Fair, and Enrolment in Physics

(Studied at KCSE level in Secondary Schools in Masaba South Sub-County, Kenya)

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Abstract: *Low enrolment of students in Physics in Kenya Certificate of Secondary Education (KCSE) has attracted the attention of various stakeholders in Masaba South Sub-County. This study was anchored on John Dewey's Education Theory. The study sought to answer the question that: To what extent does involvement of students in Physics club activities and science and Engineering Fair influence enrolment of students in Physics at KCSE level in secondary schools in Masaba South Sub-County, Kisii County? This study used a mixed method approach, specifically, a convergent parallel mixed -method design with a population of 44 public secondary schools from where 13 were sampled. The 13 principals of the selected schools were purposively included in the study as well as 13 HODs and 13 Physics teachers. Krejcie and Morgan (1970) table was used to sample 354 out the 4,199 form four students in the sub county. Questionnaires for students, teachers of Physics and Heads of Department (HODs) and interview guides for Principals were used for data collection. The study obtained correlation coefficients of Alpha, $\alpha = 0.761$, for student's questionnaire, $\alpha = 0.897$ for teachers of Physics questionnaire and $\alpha = 0.899$ for HODs questionnaire. Thus, the study instruments were considered reliable as their reliability coefficients $\alpha > 0.70$. The study achieved an overall response rate of 97.7%. The level of participation in Science Engineering Fair was generally to a low level as majority could only go up to the regional level 91 (26.2%) although Science club activities were found to improve the interest of students to learn Physics (Mean = 3.63 ± 1.437). The study established that there is a statistically significant relationship Chi-Square, $\chi^2 = 6.606$ ($p = 0.037$) between student participation in Physics Club and SEF and students' enrolment in Physics at KCSE ($p < .05$). The study concludes that participation in science/Physics club activities as well as SEF enhances confidence and understanding of Physics concepts. The study recommends that school principals should facilitate formation of Physics clubs in addition to the existing science clubs in their schools.*

Keywords: *Science Engineering Fair, Physics, Enrolment,*

1. INTRODUCTION

1.1 Introduction and Background to the Study

Physics is one of the science subjects taught at secondary school level of education in Kenya. It deals with the study of matter and its relation to energy (Kariuki and Balaramann, 2003). The study of Physics make learners understand simple phenomena of life like causes of the solar system, work and energy. The study of Physics in schools and other levels like colleges and universities is relevant to the students and society today. According to KNEC (2005), Physics makes learners discover and explain the order of the physical world, develop capacity for critical thinking in solving problems and contribute to technological and industrial development of the nation. Physics is basic for understanding the complexities of modern technology, and essential for technological advancement of a nation in various sectors such as telecommunications, architecture, engineering, electricity production and transmission, construction, and transport (Erinosho, 2013).

Physics believed to one of the oldest and probably the most developed of all the sciences (Keith, 1996), addresses the most fundamental questions regarding the nature of the physical universe. It asks questions such as: what is the nature of the universe? What is matter made of? What are the fundamental forces in nature? Because Physics is the study of these and other basic questions, it provides the foundation for all other physical sciences. The ultimate description of all physical systems is based on the laws of physical universe usually referred to as the laws of Physics (Nathan and Brian, 1995).

However, despite its significance, studies indicate that the numbers of students who study it continue to dwindle from time to time and this has become an issue of international concern (Semela, 2010). According to Samela (2010), students in most countries do not take Physics in their final examination at high school. In Australia and the Western world, there is growing concern about the low enrolment in Physics at senior secondary level and consequently the number of students who decide to pursue technology and engineering related courses in university is very low (Semela, 2010). Chinese scholars have pointed out that Chinese students generally feel senior secondary Physics is difficult, uninteresting and irrelevant to life experience (Zhu, 2007). A similar situation has been noted in Nigeria where the number of students taking Physics in high school and consequently at tertiary level continue to decline and thus a small number of them qualify to join courses related to medicine, engineering, architecture or pharmacy (Taale, 2011).

In Kenya, during the period from 2013 to 2017, Physics has been done by less than 30% of all the registered candidates (KNEC, 2018). For example, in 2013, 26.9% students registered for Physics, while 26.2% of students registered in 2017. The low trends in the enrolment of students taking Physics is worrying, given the fact that Kenya's vision 2030 is anchored on the sound foundation in mathematics and science subjects. It is clear that there are certain factors responsible for this low enrolment nationally and Masaba South is not an exception. In Kenya, Physics curricular challenges range from methodological issues, lack of personnel, to political, economic and cultural factors (Okere, 2000). Other critical issues that affect Physics curriculum implementation in Kenya include: the difficulty and abstractness of certain topics; mismatch between language of instruction and the commonly used language; shortage of appropriate books; pressure of examination-oriented curricular and lack of adequate and relevant Physics apparatus (Changeiywo, 2002).

The main aim of providing science club activities in secondary schools in Kenya is to motivate students and promote the value of science in society (KIE, 2006). According to Esokomi, Indoshi and Oduor (2016), the science club activities effectively supplement conventional teaching methods of Physics in secondary schools. The students participating in science clubs always perform better, more encouraged and develop more interest in the subject than non-participants. The science club activities also provide learners with room for interpersonal communication and collaboration skills as they work through the activities together. Kenya Science and Engineering Fair is one such activity where learners find opportunity to work together in groups as they prepare science projects. Previous researches addressing the challenges of teaching and learning of Physics in secondary schools in Kenya have focused on classroom environment (Eshiwani, 1983, Mondoh, 1999, Changeiywo, 2002, Ndirangu & Chege, 2002). Andrew (2006) observed that students learn effectively through active learning methods such as project work, field trips and science club activities. It is against this background that this study

was undertaken in order to assess the mechanisms put in place to improve enrolment in Physics in Secondary schools in Masaba South Sub-County, Kisii County.

1.2 Statement of the Problem

Despite a general increase in enrolment in secondary schools due the free primary school education (FPE) and free day secondary school introduced by the government in 2003 and 2008 respectively, enrolment in Physics has remained at a low percentage, compared to the other science subjects, all over the country and Masaba South has not been an exception. At the teacher training level, low enrolment at secondary school level is bound to affect the production of Physics teachers at higher levels. Indeed, this is the case in many schools across the country (Nderitu 2007).

Low enrolment of students in Physics in Kenya Certificate of Secondary Education (KCSE) has attracted the attention of various stakeholders in Masaba South Sub-County. Political leaders, principals of schools, and educationists have decried the low enrolment in Physics in the sub-county during KCSE. They have argued that if the trend continues, the sub-county will have very few students joining competitive science based courses which require that a student must have taken Physics as a subject of study at KCSE level (KESSHA, 2016). Their observation during a stakeholders meeting at Masimba Social Hall was that some schools did not even have a single student enrolled in Physics for their KCSE certificate. Some schools had very low Physics candidature compared to the total school candidature. This was a worrying situation which required urgent attention.

However, whereas studies have been carried out on the issue of low enrolment in Physics in secondary schools in Kenya, most of the studies have laid more emphasis on performance and enrolment in Physics in high schools. Few if any such studies have focused on how the low enrolment trends can be addressed with a view to reversing it.

1.3 General Objective

The general objective of the study was to to establish what extent does involvement of students in Physics club activities and science and Engineering Fair influence enrolment of students in Physics at KCSE level in secondary schools in Masaba South Sub-County, Kisii County.

1.4 Research Questions

To what extent does involvement of students in Physics club activities and science and Engineering Fair influence enrolment of students in Physics at KCSE level in secondary schools in Masaba South Sub-County, Kisii County?

2. LITERATURE REVIEW

This study was anchored on John Dewey's Education Theory. Dewey makes a robust case for the importance of education not solely as an area to realize content data, but also as a place to learn how to live. In his theories of education Dewey aimed to integrate the school with the society, and the processes of learning with the actual problems of life, by going through application of the principles and practices of democracy. John Dewey's theory has the implication that students ought to be engaged in meaningful activities in an exceedingly faculty scenario. Teachers ought to use pedagogic innovations geared toward making learning environments, opportunities and strategies for learners to take charge of their own learning. The role of the teacher is to guide learners rather than dispensing data.

Previous studies indicate a positive correlation between student achievement and engagement in non-formal curricular activities of field trips, clubs and science competitions. A study by American Institutes for Research (2005) which examined the effects of outdoor education on the youth in California showed positive impact. The results showed that 225 students concerned in out of sophistication activities fully fledged a mean twenty-seven per cent gain in science scores as measured by pre and post take a look at scores of the experiment. The performance on the two tests revealed a gain for the length of the study with no significant loss in the score after ten weeks. In a study on effects of munition on student action and motivation in science education, Andrew (2006), found after one semester with seven fieldwork experiences the general population of students experienced a significant seven percent increase in achievement from the pretest to posttest results. Fieldwork

magnified student action as a result of the scholars determined science and its applications within the real flora and fauna (Braund & Reiss, 2006).

Adeyemo (2010) in an exceedingly study checked out the connection between students' participation at school based mostly non-formal activities and their action in Physics in metropolis State of African country. He analyzed data from a survey of two hundred students of senior secondary III Physics students. The research investigated non-formal activities of sports, debating, school clubs, music, dance and other related social activities.

Result showed, participating in non-formal activities influenced student achievement and interest in Physics and non-participation in the activities lead to poor academic achievement.

Adeyemo (2010) additional noted aside from tutorial action, non-formal activities taught students real life skills of leadership, cooperation, social negotiation and reduced drug and a alcohol use among students.

School Club Activities (SCA) are a means for students to better understand scientific concepts, processes and procedure (McGee-Brown, Martin, Monsaas, & Stombler, 2003). These activities enhance student achievement and interest in science and allow students to gain scientific inquiry skills and develop scientific reasoning as well as to improve their communication skills (Abernathy & Vineyard, 2001; Bernard, 2005; Czerniak & Lumpe, 1996). These activities motivate students to work together and share ideas, experience and knowledge. In turn, students take ownership of their ideas and learning, and feel a sense of belonging to a group (Abernathy & Vineyard, 2001). Students who view themselves as members of a scientific learning club or community are always more motivated to participate and commit themselves in the activities. Overall, the science club activities which are undertaken as out of classroom and sometimes after school programs stimulate students' interests and may positively influence academic achievement of them, as well as expand participants' sense of future science career choices (NRC, 2009).

When students develop an interest in a science subject and the related activities, this interest may lead them to pursue a career related to that subject area (Buxton, 2001). For instance, research claims that students' engagement in authentic informal educational science activities in their early years enhances their interest in science (Maltese & Tai, 2010; Tindall & Hamil, 2004). Also, studies indicated that activities set in the real world and incorporate students' daily lives increase their interest in science as well (Cleaves, 2005; Lindahl, 2007). Therefore, providing a supplementary when category or faculty program alongside regular faculty work could facilitate students take into account a selected science major in school (Bell, Lewenstein, Shouse, & Feder, 2009; NRC, 2009; Zoldosova & Prokop, 2006). The above findings can be explained with Carl Rogers' facilitative learning and Albert Bandura's social learning theory. The basic premise of facilitative learning theory is that learning occurs when the educator acts as a facilitator and establishes an atmosphere in which students feel comfortable to explore and take a look at new ideas while not having the concern of external threats (Laird, 1985). Indeed, teacher's roles in after school clubs are not only that of a facilitator but as well as setting the stage for a safe and productive collaborative project study groups. In these small groups, students are encouraged to take responsibility for their own learning and development of the project that they are going to compete with.

Most of the input and analysis comes from students in finishing the task with the feedback from their lecturers.

Bandura's social learning theory explains the rest of what happens in those study groups. As students' analysis and see however different comes square measure done or however their teacher/facilitator and/or coach demonstrates sample steps of what's being studied, students learn and begin imitating, observational learning, thus developing their own learning. Bandura also indicated that external and environmental factors are not the only factors affecting learning and behavior. He further mentioned intrinsic reinforcement as a form of internal motivation, such as satisfaction, pride and sense of accomplishment (Bandura, 1977). As students become acquainted with the content they work with and become successful at competitions, like during the Science and Engineering Fair Competitions, they start feeling the pride of being part of the club, thus considering future competitions in similar fields. Eventually, this may lead students to consider studying those subjects in college as well as career they are going to pursue in college (Hansen, 2011).

The primary aim of providing science club activities (SCA) in secondary schools in Kenya is to motivate students and promote the value of science in the society (KIE, 2006). The SCA may sometimes require costly materials for certain projects to be accomplished, teacher effort, expensive travel bills for hiring and fueling buses and accommodation of teachers and students and in case they travel to far places. From the reviewed studies it shows that science clubs in schools have a bearing on the interest that learners develop towards that science subject. This study therefore focused on the involvement of students in Physics club activities and how this influences their enrolment in the subject.

In order for students to comprehend and apply scientific knowledge in Physics there is need to expose them to practical work which requires adequate equipment and apparatus. Out of class activities such as Physics club activities and Science and Engineering Fair are important in enhancing interest of learners. These studies have majorly looked at what learners would achieve but not how enrolment would be improved. This study investigated how enrolment would be improved by specifically looking at the influence of the involvement of students in Physics or Science club activities and Science and Engineering Fair.

3. METHODOLOGY

3.1 Research Design

This study used a mixed method approach, specifically, a convergent parallel mixed -method design. In this method researcher collects both quantitative and qualitative data, analyses them separately and compares the results to see if the findings confirm or disconfirm each other (Creswell & Clark, 2011, Creswell, 2014).

3.2 Target Population

This study was carried out in Masaba South Sub-County. The Sub-County consists of 44 public secondary schools. Out of these schools, two are girls' schools, one boys' school and 41 are of mixed gender. The Sub-County has about 19340 students. The target population consisted of all the 44 public secondary schools, 4,199 form four students, all teachers of Physics, Heads of Physics or Science Department and Principals of the selected secondary schools also constituted the target population, (Masaba South, SCDE's Office).

3.3 Sampling

The schools were selected using purposive sampling and systematic sampling methods. The sub county has two divisions namely Kiamokama and Masimba Divisions. Kiamokama Division has 20 secondary schools with 1 Boys' secondary school, 1 Girls' secondary school and 18 mixed secondary schools while Masimba Division has 24 secondary schools with 1 Girls' secondary school and 23 mixed secondary schools. The researcher sampled 30% of the total number of schools to be involved in data collection. According to Mugenda and Mugenda (2003) a sample size of 10 – 30% of the target population is considered adequate. This gave a sample of 13 schools to represent the 44 schools. The 2 Girls' Secondary Schools and the 1 Boys' Secondary School were purposively sampled. The remaining 10 secondary schools were sampled proportionately from the 41 mixed secondary schools. For piloting 2 schools, 1 from each division was used in the pilot study. The schools used for the pilot study were conveniently left out in the final study sample. This gave a total of 13 schools selected for the study.

The principals whose schools were selected were automatically included, that is purposively selected for the study. A total of 13 Principals, 13 HODs and 13 Physics teachers were selected from the participating schools. In selecting the sample of students, Krejcie and Morgan (1970) table was used. 354 students out the 4,199 form four students in the sub county were selected. For data collection, three types of instruments were used. These were questionnaires for students and teachers of Physics, focused group discussion guides for students and interview guides for Principals.

3.5 Validity and Reliability

Content validity was established by the researcher requesting his supervisors to scrutinize the instruments so as to judge the appropriateness of the items and to determine their relevance to the variables and objectives of the study. Reliability was established through use of test-retest method. The

same instrument was administered to the same group of respondents after a period of two weeks and the responses in the first and second obtained. The questionnaires that were used during the actual study were administered on respondents in two schools in the sub-county that did not participate in the actual study. The responses from this first test were analyzed and kept. After two weeks, the same questionnaires were administered to the same respondents and the responses were again analyzed. The scores of the two tests were correlated by use of Pearson Product moment to obtain a correlation coefficient that established the extent to which the contents of the instruments were consistent in yielding the same responses every time the instrument was administered. The study obtained correlation coefficients of Alpha, $\alpha = 0.761$, for students' questionnaire, $\alpha = 0.897$ for Physics teachers' questionnaire and $\alpha = 0.899$ for HODs questionnaire. Thus, the study instruments were considered reliable as their reliability coefficients $\alpha > 0.70$.

4. FINDINGS AND DISCUSSIONS

The study sample comprised of 13 Principals, 13 HODs, 13 Physics teachers and 354 form 4 students. Consequently, 12 principals, 13 HODs, 11 Physics teachers and 348 students returned duly filled questionnaires and interviews for a response rate of 92.3%, 100.0%, 84.6% and 98.3% respectively. Thus, the study achieved an overall response rate of 93.8%.

4.1 Demographic Information

Majority of the Physics students who participated in the study 217 (62.4%) were female with male students being 131 (37.6%). Further, majority of the student respondents were from mixed schools 283 (81.3%) with another 36 (10.4%) coming from pure girls' school while only 29 (8.3%) came from pure boys' school. Similarly, the study found that majority of the Physics teachers and HODs were male 18 (75.0%) with female Physics teachers and HODs being 6 (25.0%) and that majority of the Physics teachers 9 (81.8%) were aged 30 years and below compared to HODS where a majority of 8 (61.5%) were also aged 30 years and below. The professional qualification of the teachers and HODs was found to be satisfactory as majority 21 (87.5%) had Bachelors in Education degree to teach with another 1 (4.2%) having PhD in the field. In terms of teaching experience, majority of the teachers and HODs 15 (62.5%) had taught for less than 5 years, a cumulative total of 9 (37.5%) had taught Physics for 5 or more years.

4.2 Participation in Physics Club Activities

The researcher sought to know whether the school had a specific Physics club or a general science club. This is because, availability of a specific Physics club outlines focus on Physics subject while encouraging activities related with the learning of Physics.

Table 1. Participation in Physics Club Activities and SEF

Variable	Response	N	%
Type of club in school	Physics club	105	30.2
	Science club	243	69.8
	Total	348	100.0
School participation in SEF	Yes	245	70.4
	No	103	29.6
	Total	348	100.0
Level of school participation in SEF	Does not participate	103	29.6
	Sub-County	38	10.9
	County	80	23.0
	Regional	91	26.2
	Nationals	36	10.3
	Total	348	100.0

Source: Researcher, 2019

From the findings, majority of the schools 243 (69.8%) had a single science club with only 105 (30.2%) reporting that they had pure Physics Club. This shows that there is low focus on Physics as a subject. In terms of participation in Science Exhibition Fair (SEF), majority of the schools 245 (70.4%) participate in SEF with only 103 (29.6%) indicating that they do not participate. However, the level of participation was generally to a low level as majority could only go up to the regional level 91 (26.2%) with another 80 (23.0%) reporting that they participate up to the County level. Further, 38 (10.9%) only participate at the Sub-County level. Increased participation in SEF to higher level would enhance student interest in Physics. However, Andrew (2006) found that after one semester with seven fieldwork experiences the general population of students experienced a significant seven percent increase in achievement from the pre-test to post-test results. Similarly, the principals also recommended that:

> "There is need to encourage more learners to participate in SEF by providing materials required to participate while involving the teachers to assist students in coming up with projects that they can present in SEF will increase enrolment in Physics". [Interview: Principal 7, July 17th 2019]

Such participation, if well facilitated and supervised will enhance student interest in Science subjects especially Physics. They get to participate in innovative projects thus understanding the concepts.

Views of student on the influence of their participation in Science/Physics Club as well as Science Exhibition Fair (SEF) were sought from a 10 item Likert scale. The items were rated on a scale of 1 to 5 as 1 = strongly disagree (SD), 2 = disagree (D), 3 = undecided (U), 4 = agree (A) and 5 = strongly agree SA). The data was summarized into frequency and percentages. The item means and standard deviations were also computed as presented in Table 2.

Table 2. Influence of Participation in Physics Club Activities and SEF on Physics Enrolment

STATEMENT	SD	D	U	A	SA	Mean	STDEV
Science club activities have improved my interest to learn Physics	54 (15.5)	34 (9.8)	20 (5.7)	118 (33.9)	122 (35.1)	3.63	1.437
Classwork has improved my interest to learn Physics	12 (3.4)	7 (2.0)	1 (0.3)	155 (44.5)	173 (49.7)	4.35	0.878
I like Physics when I participate in science club activity or science and engineering fair	31 (8.9)	26 (7.5)	52 (14.9)	149 (42.8)	90 (25.9)	3.69	1.191
I like Physics when we learn in class	11 (3.2)	37 (10.6)	15 (4.3)	174 (50.0)	111 (31.9)	3.97	1.036
Science club activities have helped me improve my marks in Physics	46 (13.2)	54 (15.5)	58 (16.7)	108 (31.0)	82 (23.6)	3.36	1.346
Classwork has helped me improve my marks in Physics	6 (1.7)	20 (5.7)	10 (2.9)	147 (42.2)	165 (47.4)	4.28	0.901
I feel like Physicist when I participate in science or Physics club activities	35 (10.1)	28 (8.0)	56 (16.1)	99 (28.4)	130 (37.4)	3.75	1.305
I feel like Physicist when I learn Physics in the classroom	22 (6.3)	20 (5.7)	18 (5.2)	166 (47.7)	122 (35.1)	3.99	1.098
I understand the nature of Physics by participating in Physics or science club	32 (9.2)	22 (6.3)	45 (12.9)	118 (33.9)	131 (37.6)	3.84	1.252
I understand the nature of Physics by doing classwork	5 (1.4)	17 (4.9)	9 (2.6)	193 (55.5)	124 (35.6)	4.19	0.82

Source: Researcher, 2019

The findings in Table 2 show that students consider classwork to be more significant in helping them learning Physics compared to participation in Science/Physics Club activities. The students consider that classwork has improved their interest to learn Physics (Mean = 4.35 ± 0.878), that they like Physics when they learn in class (Mean = 3.97 ± 1.036) and that classwork has helped them improve their marks in Physics (Mean = 4.28 ± 0.901). Specifically, majority of the student respondents 328 (94.2%) cumulatively agree that classwork has improved my interest to learn Physics. Similarly, majority of the students cumulatively agreed 295 (81.9%) that they like Physics when they

learn in class while 312 (89.6%) also cumulatively agreed that classwork has helped them improve their marks in Physics. This shows that students consider classwork to be highly important in learning Physics.

The study also found that the students feel like Physicists when they learn Physics in the classroom (Mean = 3.99 ± 1.098) and that they understand the nature of Physics by doing classwork (Mean = 4.19 ± 0.82). These views emerged as majority of the student respondents 166 (47.7%) agreed that they feel like Physicists when they learn Physics in the classroom while another 122 (35.1%) strongly agreed. Similarly, majority of the student respondents 193 (55.5%) agreed that they understand the nature of Physics by doing classwork while a further 124 (35.6%) strongly agreed. Thus, cumulatively, 288 (82.8%) of the student respondents agreed that that they feel like Physicists when they learn Physics in the classroom and that they understand the nature of Physics by doing classwork 317 (91.1%).

However, the study found that Science club activities have improved the interest of students to learn Physics only to a moderate extent (Mean = 3.63 ± 1.437). In this case, majority of the student respondents 122 (35.1%) strongly agree that science club activities have improved their interest to learn Physics while another 118 (33.9%) also agreed. Thus cumulatively, 240 (69.0%) of the student respondents cumulatively agree that science club activities have improved their interest to learn Physics. This is despite a significant proportion 88 (25.3%) cumulatively disagreeing. The findings imply that whereas a majority of students find participation in science club activities as well as SEF to be useful in improving their performance in Physics, more than a quarter of the students do not see this as true. This could be attributed to the fact that some of the schools do not have science and/or Physics clubs while also not participating in SEF. Abernathy and Vineyard (2001), Bernard (2005) and Czerniak and Lumpe (1996) who all concluded participating in science activities motivate students to work together and share ideas, experience and knowledge. This finding was also articulated by the principals who acknowledged the value of participation in Physics Club activities as well as SEF where one of the principals said that:

> "When the school participates in Science Exhibition Fair, the students are able to come up with innovative projects which motivate and enhance their interest in Physics. Moreover, the students are able to discuss issues related to Physics concepts in the Physics hence more students can enrol for Physics". [Interview: Principal 3, July 17th 2019]

Similarly, the study found that the students moderately like Physics when they participate in science club activity or science and engineering fair (Mean = 3.69 ± 1.191). Specifically, majority of the student respondents 149 (42.8%) agreed that they like Physics when they participate in science club activity or science and engineering fair while another 90 (25.9%) strongly agreed with a significant 52 (14.9%) being neutral. However, 57 (16.4%) of the respondents cumulatively disagreed that they like Physics when they participate in science club activity or science and engineering fair. This shows that students who do not participate in science club activities and SEF do not develop the necessary interest towards the subject. According to McGee-Brown, Martin, Monsaas and Stombler (2003), School Club Activities (SCA) is a means for students to better understand scientific concepts, processes and procedure. Similarly, Maltese and Tai (2010) also claimed that students' engagement in authentic informal educational science activities in their early years enhances their interest in science

The study also found that the students feel like Physicists when they participate in science or Physics club activities (Mean = 3.75 ± 1.305) and that they understand the nature of Physics by participating in Physics or science club (Mean = 3.84 ± 1.252). Specifically, majority of the student respondents 229 (65.8%) cumulatively agree that they feel like Physicists when they participate in science or Physics club activities while 249 (71.5%) also cumulatively agree that they understand the nature of Physics by participating in Physics or science club. The finding shows that participation in science/Physics club activities as well as SEF enhances confidence and understanding of Physics concepts. Similarly, Adeyemo (2010) showed that participating in non-formal activities influenced student achievement and interest in Physics and non-participation in the activities lead to poor academic achievement.

4.3 Relationship between Participation in SEF and Physics and Enrolment in Physics

In order to determine whether there is an influence of participation in Physics Club and SEF on enrolment in Physics at KCSE, Chi Square test analysis was conducted between the need for students to take Physics and participation in Physics Club and SEF. Data on the need for more students to take Physics was categorical at two levels of yes and no while the data on participation in Physics Club and SEF was categorical at three levels of agree, neutral and disagree. The cross tabulation result showing the distribution by frequency is presented in Table 3.

Table 3: Participation in SEF and Physics Club and Enrolment in Physics

		Participation in SEF and Physics Club			Total
		Disagree	Neutral	Agree	
More students need to take Physics	Yes	6 (2.4%)	73 (29.6%)	168 (68.0%)	247 (100.0%)
	No	0 (0.0%)	42 (41.6%)	59 (58.4%)	101 (100.0%)
Total		6 (1.7%)	115 (33.0%)	227 (65.2%)	348 (100.0%)

Source: Researcher, 2019

From the findings, of the respondents who said that there is need for more students to take Physics, majority 168 (68.0%) agreed that participation in Physics Club and SEF enhances enrolment in Physics at KCSE while 73 (29.6%) were neutral. Similarly, for those student respondents who said that there was no need for students to take Physics, majority 59 (58.4%) agreed that participation in Physics Club and SEF enhances enrolment in Physics at KCSE. However, 42 (41.6%) were neutral with regard to this view. The Chi Square output is present in Table 4.

Table 4. Chi-Square Tests for Participation in SEF and Enrolment

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.606[a]	2	.037
Likelihood Ratio	8.152	2	.017
Linear-by-Linear Association	1.381	1	.240
N of Valid Cases	348		

a. 2 cells (13.3%) have expected count less than 5. The minimum expected count is 1.74.

Source: Researcher, 2019

From the findings, Pearson Chi-Square, $\chi^2 = 6.606$ ($p = 0.037$) implies that there is a very low probability of the data occurring under the null hypothesis that there is no statistically significant relationship between student participation in Physics Club and SEF and students' enrolment in Physics at KCSE ($p < .05$). Thus we reject the null hypothesis. This implies that participation in Physics Club and SEF statistically significantly influence student enrolment in Physics at KCSE.

5. CONCLUSIONS AND RECOMMENDATIONS

Based on the findings, the study concludes that that there is low focus on Physics as a subject due to lack of Physics clubs in most of the schools. However, increased participation in SEF to higher level would enhance student interest in Physics. The study also concludes that students consider classwork to be highly important in learning Physics and that, students who do not participate in science club activities and SEF do not develop the necessary interest towards the subject. Thus, participation in science/Physics club activities as well as SEF enhances confidence and understanding of Physics concepts.

The study recommends that school principals should facilitate formation of Physics clubs in addition to the existing science clubs in their schools. This will provide unique experience to the students as they focus discussion on concepts related to the study of Physics. As such, students should be encouraged to join Physics club early enough to learn various aspects of the subject. The principals should also provide resources for participation in SEF and encourage participation of more students from the school level.

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